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Multiplexing Technique for Computer Communications via Satellite Channels

A novel multiplexing scheme suitable for the satellite radio channel of a packet-switched computer communications system combines the technique of dynamic allocation with conventional time-division multiplexing. Delays are minimized and throughput is maximized because the use of the satellite channel is coordinated with the needs of ground stations. The multiplexing scheme is designed to expedite short-duration interactive or priority traffic and to delay large data transfers; as a result, each node has an effective capacity of almost the total channel capacity when the other nodes have light traffic loads.

The channel is divided into slots of fixed length, each equal to a packet transmission time. A frame time is defined, and every node is assigned at least one slot per frame; the slots are said to be owned by the assigned nodes, and are available for their use at any time. Slots are made available according to traffic volume and priority requirements; a dynamic component assigns slots currently unused by their owners to nodes with queued traffic on a round-robin basis by utilizing the broadcast nature of the channel. Each node operates with an identical algorithm that uses information stored in a channel queue table; the table is updated by the satellite from reservation information sent by each node in its own slot. Also, each node is guaranteed access to the channel after one frame time from an idle state, without regard to whether another node is using its slot.

Simulation results have shown the protocol to give markedly improved delay-throughput characteristics over conventional time-division multiplexing. This was determined for a wide range of traffic mixes made up of both interactive and file messages, using Poisson-distributed arrivals at each node. The protocol gives especially significant performance gains as the traffic imbalance increase among the nodes. For efficient channel use, it is only necessary that the total average bandwidth requirement of all nodes be approximately equal to the channel bandwidth; the total can be distributed in any manner among the nodes.

Note:

Requests for further information may be directed to:

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NASA has decided not to apply for a patent.

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